B What is claimed is

~~Claims~~:

1. Device for coupling a short pulse laser into a microscope beam path, wherein the spectral components of the laser radiation are spatially separated by means of a dispersive element (1), the individual spectral components are manipulated and are then spatially superimposed again by means of another dispersive element (3).

2. Device for coupling a short pulse laser into a microscope beam path according to claim 1, wherein the spectral components of the laser radiation are spatially separated by means of a dispersive element (1), components are manipulated in the Fourier plane/focal plane of an imaging element (manipulator 2) and are then spatially superimposed again by means of another dispersive element (3).

3. Device according to at least one of the preceding claims, wherein, after manipulation (2), the spectral components are reflected at a mirror and superimposed again by means of the dispersive element (1).

4. Device according to at least one of the preceding claims, wherein the microscope is a laser scanning microscope.

5. Device according to at least one of the preceding claims, wherein the microscope is used for investigation of nonlinear contrast methods.

6. Device according to at least one of the preceding claims, wherein prisms or gratings are used as dispersive elements.

7. Device according to at least one of the preceding claims, wherein the manipulator (2) generates an amplitude modulation of the spectral components.

8. Device according to at least one of the preceding claims, wherein the manipulator (2) generates a phase modulation of the spectral components.

9. Device according to at least one of the preceding claims, wherein the device is followed by a single-mode fiber F for coupling in a short pulse laser.

10. Device according to at least one of the preceding claims, wherein the single-mode fiber is also polarization-preserving.

11. Device according to at least one of the preceding claims, wherein a spatial light modulator (SLM) is used in the Fourier plane as a manipulator (2).

12. Device according to at least one of the preceding claims, wherein the manipulator (2) is purposefully optimized by feeding back the measurement signal (4) and the desired measurement signal is therefore adjusted.

13. Device according to at least one of the preceding claims, wherein the phase modulation in the modulator (2) is used to compensate higher-order dispersion by means of the feedback.

14. Device according to at least one of the preceding claims, wherein the phase modulation in the modulator (2) is optimized depending on the center wavelength of the short pulse laser (6) by means of the feedback.

15. Device according to at least one of the preceding claims, wherein the phase modulation in the modulator (2) is optimized depending on the utilized objective by means of the feedback.

16. Device according to at least one of the preceding claims, wherein the phase modulation in the modulator (2) is optimized depending on the utilized average output by means of the feedback.

17. Device according to at least one of the preceding claims, wherein, by means of the feedback, the phase modulation in the modulator (2) is adjusted depending on the depth of penetration (5) into a preparation to be examined and a nonlinearly excited fluorescence signal is therefore optimized.

18. Device according to at least one of the preceding claims, wherein the pulse front and the spherical aberration are optimized additionally by means of an adaptive element AO.

19. Device according to at least one of the preceding claims, wherein the phase modulation in the modulator (2) is optimized depending on the utilized objective by means of the feedback.

20. Device according to at least one of the preceding claims, wherein a specific excitation of fluorescence dyes is carried out by means of the phase modulation and amplitude modulation in the modulator (2).

21. Device according to claim 19, wherein this is carried out selectively.

22. Device according to at least one of the preceding claims, wherein a specific resolution of reactions (FRET, uncaging) in the fluorescence dyes is carried out by means of the phase modulation and amplitude modulation in the modulator (2).

23. Device according to at least one of the preceding claims, wherein a specific bleaching of dyes is carried out by means of the phase modulation and amplitude modulation in the modulator (2).

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